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ABSTRACT

A study determined whether computer assisted instruction (CAI) had an effect on students' reading achievement. Subjects were 21 randomly selected fourth-grade students at D. S. Wentworth Elementary School on the south side of Chicago in a low-income neighborhood who received a year's exposure to a CAI program, and 21 randomly selected students at the same school who did not receive CAI in reading. Subjects' scores on the Iowa Tests of Basic Skills were compared. Results indicated no statistically significant increase or decrease in reading achievement for either group. Findings agree with earlier studies which indicated that CAI is effective in some instances and neutral in others. (Contains 18 references and one table of data.) (RS)

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The effect of CAI on reading achievement

Regina Hardman

The rapid and extensive proliferation of computers in schools reinforces the notion that computers are symbols of "modern" schools and that awareness of computers will confirm the fact that schools are up-to-date.

There are varied opinions about the effectiveness of CAI in the classroom, however most authors do seem to be in favor of the use of computer assisted instruction (CAI) (Hawkridge 1990).

Becker (1992) was critical of research which reported score gains for hundreds of students in two Chicago Public schools. The positive effect sizes in those schools are not on substantial year-to-year gains during CAI years but on extremely low gains during prior (comparison) years. At these two schools, students gained an average of about 7/10 to 3/4 of a grade equivalent per year prior to their use of computers, a level typical of inner-city schools. But in pre-computer years, students gained only about 4/10 of a grade equivalent per year, a level lower than likely to exist at any other regular public school in the country with normal test administration and scoring conditions (Becker 1992).

It is important to determine if benefits accrue to the students by reason of the proliferation of computers and to add to the available knowledge of these benefits. Choices must be made about programs and knowledge to be transmitted and their value to the student and to society (Becker 1987).

Hawkridge (1990) noted that when computers were used in schools it is to learn a selected topics from the schools curriculum, with the computer and educational software either complementing or temporarily replacing the teacher. They are used to enrich the existing curriculum and improve the way in which it is delivered, by using computers as sophisticated educational tools which can extend traditional ways of presenting information to children and offer new opportunities through techniques possible only with computers. The addition of microcomputers in the school helps young people explore new technologies through which future ideas will be communicated. The computer permits interaction almost instantly, putting students in decision making positions, in control of endless amounts of information, and with tremendous power in their hands.

The growing availability and use of computers in education has prompted researchers to look for measurable effects of computer-assisted learning on testable outcomes. Baird and Silvern (1992) attempted to determine if there were effects associated with learning in one mode and testing in another; or test validity in assessing computer learning. A meta-analysis of 54 studies by Kulik, Kulik, and Cohen (1980) uncovered and effect size for computer-based instruction that ranged from -1

to almost +3 on achievement. Thirty-seven of the 54 studies favored computer-based instruction while 17 favored conventional instruction. The study did not examine type of test used to assess targeted learning. Many variables may interact, which makes definite conclusions on effect of computer instruction difficult. Clark (1983) noted some explanations for the conflicting results such as variance in teaching styles and applications of the computer, types of supplementary materials used in computer learning, and prior knowledge of the learner.

Problems plaguing computer assisted instruction included curricular problems described in PLATO PERC (Swinton, Amarel, and Morgan 1979).

Yeager (1977), expressed the need for experts in reading to give their time to the development of CAI reading materials. "Most of the existing reading curriculum has been developed by people...who have had little or no background in reading" (p. 37).

In conclusion, Ely (1993) put it best when he concluded that where deliberate efforts have been made by teachers and the learners will never be the same. They have gained new skills, new perceptions of how to learn; increased motivation, and renewed entnusiasm for teaching and learning.
Justification for computer learning is often sought in research findings that "prove" their value in acquisition of knowledge as tested by traditional means. Perhaps there are other measures of success that have not been tested or are beyond testing such as attitudes toward learning, willingness to pursue problems until they are solved, and changing of the teacher from a presenter of information to a facilitator of learning.

The relationship between teacher computer usage and students' reading achievement scores was investigated by Schaudt (1985). The researcher hypothesized that the use of CAI as part of a direct instruction lesson could explain in part the variance in student reading achievement scores. A sample of 66 elementary classroom reading teachers from an east Texas school district participated in the study. The scale instrument used was designed to identify teachers who use the computer in a direct fashion and those who use it in a non-direct fashion. Direct CAI was defined was defined as the use of computers as an additional material to support a direct instruction reading lesson. Direct instruction was defined as lessons which have an academic focus, are teacher-directed, have goals that are made clear to students, in which sufficient time is allocated for teaching, and during which the teacher monitors student performance. Non-direct CAI was defined as the use of computers in a center, free-time, or reward activity, including any form of use outside a direct instruction reading lesson. Results of the study did not support the hypothesis. However, significant findings at the $p < .01$ level suggested that primary teachers use direct CAI more than intermediate teachers and that they allocate more time to CAI and reading than do intermediate teacher. Also

significant at the $p < .01$ level was the finding that those primary teachers who used direct CAI and allocated more time to CAI in reading did have students with higher reading achievement scores.

Arroyo (1992) studied the results (ECI) on inner-city seventh grade students. Computers were situated in the "homeroom" and could be used in all subject areas. She cites a number of studies that suggest there is potential for improvement or improvement in achievement when CAI is used in the classroom. The findings from her research show a significant gain, as shown by the t scores of (0.307) for 1991 and (3.5) for 1992 of the experimental over the control group.

Schaudt (1987) conducted a study in the use of computers in a direct instruction reading lesson. Computer-assisted instruction has the potential to be an effective tool in helping students master targeted reading skills if time is allocated on the computer for sufficient and continuous content coverage, performance is monitored, and the teacher chooses software appropriate for the students ability levels. Pearson (1985) suggested a new model of teaching in which the teacher assumes a more central and active role in instruction. This role is highlighted with the teachers helping the student to gradually move toward total responsibility of skill acquisition. It may also serve to increase student motivation to learn, to enhance the monitoring of student progress, and to free the teacher to provide more contact with individual students. Computer-assisted instruction presents a feasible tool for increasing teacher effectiveness.

Wepner (1989) after doing an extensive study on reading software along with individual case studies concluded that the computer's ability to combine sound reading practices with non-threatening, humanistic feedback in pleasingly structured environment makes it ideal for students with reading problems. When used with a discerning eye, the computer can become a "natural" part of any reading classroom for students with reading difficulties.

Warren and Rosebery (1988) found that use of CAI resulted in marked improvements in both speed and accuracy of isolated word an pseudoword decoding. Students showed overall gains in pronunciation speed, the greatest gains being for the most difficult test items. Students overall accuracy forward an pseudowords also improved from, 73% on the pretest to 87% on the posttest. Warren and Rosebery also found that the computer can play an important role in contextualizing reading instruction, provided it is not viewed as an autonomous agent of change. Its potential as a tool for reading instruction depends on the quality of its design (e.g. the psychological and pedagogical (underpinnings) and on the nature of the contexts in which it is used.

Fitzpatrick (1991) said that the teacher is the most important variable in CAI. Computers challenge teachers to learn new technology and also to act as learner and teacher at the same time. Teachers are challenged to experiment as they learn to use computers and determine how to best integrate CAI

into the curriculum. While schools have made progress in their effort to train teachers in the use of instructional technology, many teachers remain unfamiliar and uncomfortable with computers and the technology. Apple (1992) noted research indicating that a few teachers are given substantial information or training before computer curricula are implemented. Kearsey and Lynch (1992) accuse schools of failing to provide adequate training--enough or the right kind--the time and hands - on practice to properly learn a system is often overlooked or is too minimal.

Literature on research relating to the effect of CAI on reading achievement seemed adequate. The literature seems to suggest that CAI does increase the achievement level of reading students who use CAI programs. The literature also seems to suggest that in instances, CAI does not increase or decrease the achievement level of students using it. The literature does suggest that, in most cases, the motivational level of students was increased and their attitudes toward school improved.

In summary, these studies indicate that computer CAI applications have an important role to play in the future of education, however the exact nature of that role needs to be explored. Additional research definitely needs to be done in this area. The next decade will be a time to take advantage of both research and technology.

Therefore, the purpose of this study is to determine what is the effect of CAI on reading achievement?

Procedures

The population of this study will include 67 fourth grade students. The students attend D. S. Wentworth Elementary School which is located in a predominantly low income socio-economic neighborhood on Chicago's south side. The population is comprised of 100% minority students.

From the 67 fourth grade students, the school records showed that at least 21 fourth graders received CAI in reading while 46 did not receive the program. Twenty-one students were randomly selected from each of these sub-populations.

Two fourth grade samples were identified from the school records of those students who had received CAI in reading and those students who had not received the program. Both samples were administered the Iowa Test. The posttest only control group design will be employed.

The finding will be tabulated in terms of means and standard deviations. The t test will be employed at the .05 level of confidence to determine if there is any statistically significant difference between the mean scores.

Findings of the Study:

The samples for the study included fourth grade students of D. S. Wentworth Elementary School. Each Spring students take the Iowa Tests of Basic Skills (ITBS). From these fourth grade students, two groups were randomly selected. Subjects in one group were given the CAI reading program while subjects in the other group were not given the program. Results from the 1994 ITBS reading subtest were used as a posttest. A t test ($p < .05$) was done to determine if there was a statistically significant change in reading achievement after exposure to the CAI reading program. Table 1 summarizes the statistical analyses.

Table 1

Means, Standard Deviaton, and t Tests for the Experimental Group and Control Group for Reading Achievement Scores

Reading (N=21)

Test	Experimental	Control	t
Posttest			
M	6	4	1.58
SD	3.0	4.9	

df=40 p .05
*significant at the .05 level

Examination of the 1994 mean posttest scores reveals after one year of exposure to CAI reading program, that there is no statistically significant increase or decrease in reading achievement of the E-group or C-group.

The t scores of the 1994 results (1.58) show no significant changes in reading for the two groups.

Overall, the data lead to the acceptance of the null hypothesis and rejected the research hypothesis that students in CAI reading program will have higher readinag scores than those students who do not have CAI: fourth grade students taught reading using CAI will not obtain significantly higher reading scores than those students who do not have CAI.

More follow-up research is needed in this study as more students participate in the CAI reading program. The results are not surprising in that the review of literature indicated that CAI is effective in some instances and neutral in others.

As Clark (1983) noted "many variables may interact, which makes definite conclusions on effect of computer instruction difficult".

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In summary, these studies indicate that computer CAI applications have an important role to play in the future of education, however the exact nature of that role needs to be explored. Additional research definitely needs to be done in this area. The next decade will be a time to take advantage of both research and technology.

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